Message

**From**: WOOLHOUSE Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=9C4153BCEE124D7181397F6F48883523-MEJW]
**Sent**: 31/01/2020 4:35:39 PM
**To**: Catherine.Calderwood@gov.scot
**CC**: Gregor.Smith@gov.scot; CMO@gov.scot
**Subject**: RE: novel coronavirus - informal briefing #4 CONFIDENTIAL

Dear Catherine,

There is some additional information (some or all of which you may already be aware of) to add to my previous briefings on this topic. There's not much good news I'm afraid.

First, several groups have been estimating the two parameters that determine the size and timescale of an epidemic (in Scotland or anywhere else): the basic reproduction number and the generation time. Estimates of the former are higher than before and estimates of the latter are slightly lower than had been assumed. This means that any epidemic will be bigger and faster than we were anticipating a week ago. So more difficult to control.

Second, there is now some evidence of transmission from cases before symptoms are apparent. The evidence is, in my view, low quality to date, but it is accumulating. If pre-symptomatic transmission occurs at a significant level then this would compromise efforts to contain spread by case isolation, which is the primary tool available to us at this time. So even more difficult to control

Third, there is still no robust estimate of the case fatality rate. Chris Whitty was quoting 2% today, which is still a high figure. If there are large numbers of mild, unreported cases then this would come down. Equally, in China they are now in the exponential phase of the epidemic, and in that phase we expect case fatality rates to be underestimated (as not all cases that will die have died). The way this information gap seems most likely to be filled using clinical data from the cases exported from China. To date, none of these have died. If that pattern of lower severity continues and hardens in the coming days and weeks then this would be greatly encouraging.

As we stand, however, the epidemiological indicators make the potential epidemic in Scotland of the same order as the Reasonable Worst Case for pandemic influenza used for planning purposes, and perhaps even more severe than that scenario. In which case our preparedness will be tested to the very limit. There has not yet been, to my knowledge, any formal modelling of the burden on health care systems, but the consensus seems to be that we could be completely overwhelmed (including any surge capacity) within 2-3 months of the epidemic taking off. As always, I must stress that this is NOT a prediction. But it is a possibility that cannot be excluded given currently available information.

I have shared a more formal version of my earlier report to you with colleagues at HPS – our assessments agree well.

We will continue to monitor the situation and report any developments that reinforces or alters this assessment.

Kind regards,
Mark Woolhouse

Professor M.E.J. Woolhouse OBE FRSE FMedSci,

Usher Institute,
Ashworth Laboratories, Kings Buildings, University of Edinburgh,
Charlotte Auerbach Road, Edinburgh EH9 3FL, UK

Tel. **Irrelevant & Sensitive**
Fax

Email mark.woolhouse@ I&S
www.epigroup.biology.ed.ac.uk


**From:** WOOLHOUSE Mark <Mark.Woolhouse@ I&S
**Sent:** 26 January 2020 11:37
**To:** Catherine.Calderwood@gov.scot
**Cc:** Gregor.Smith@gov.scot; CMO@gov.scot
**Subject:** Re: novel coronavirus CONFIDENTIAL

Catherine,

I am here extending my briefing. Again, this advice is closely aligned to the advice that Chris Whitty and Patrick Vallance have received from Jeremy Farrar and Neil Ferguson.

We continue to have three scenarios in play.

First, there is containment of any introductions/outbreaks within Scotland/UK. You do not need advice from me as to how to implement that as effectively as humanly possible. I'd put 2 caveats on it though.
1) This strategy is to a large extent dependent on every other country that receives imported cases achieving the same thing. If the virus becomes widespread outside China the challenge could quickly become insurmountable. In the longer term it depends on China bringing their outbreak under control. They are far from achieving that as of today.
2) Coordinated international action would be facilitated by WHO declaring a PHEIC. The sooner they do that the better in my view.
The key point is, however, that we would be very unwise to bank on this scenario.

Second, there is the not-much-worse-than-a-bad-flu-season scenario. This would be the scenario if indeed there are large numbers of unreported, mild cases in China and the true case fatality rate is far lower than current WHO estimates. Much of the preparedness planning for an influenza epidemic would be relevant and appropriate here, but we'd have to cope without a vaccine or a treatment (see below).
The measures that would be important are much the same as for the third scenario.

Third, the SARS scenario. This is the scenario that I outlined for you yesterday (though I didn't give you the worst case version of it). This is what we have to expect if the current case fatality rates are roughly correct.
The measures we could consider are:
A vaccine. There is general agreement that having a vaccine ready to deploy against a novel virus in anything under a year would be an extraordinary achievement. In the meantime, we have to manage without.

Antivirals. This isn't my area of expertise so you will need additional, more expert advice on this point. But my understanding is that there isn't a antiviral available for any coronavirus as of now (despite lots of work with MERS coronavirus). As long as that is the case we have to manage without.

So we are back to public health measures.
1) Case isolation, infection control and contact tracing. This were absolutely vital for SARS and will surely be the mainstay of any control effort for this virus. They become much more difficult to implement as the numbers of cases rise and resources are stretched. But tremendously important. I am not the one to advise on implementation nor the appropriateness of whatever is already in place. Suspect cases provide an opportunity to learn of course.
2) Public messaging. Also tremendously important. So we need to think about the messages (and hopefully are already doing so).
3) Social distancing. A big topic covered by preparedness planning so you don't need me to advise on this.

Next steps.
My colleagues in England are pushing for a COBRA meeting asap. Are we planning a SGoRR meeting here?
I do think that communication with the public is vital but hugely challenging when there's so much uncertainty. A government statement - one with substance - would be extremely helpful, and the sooner the better. The scenarios I described are already in the public domain.

Kind regards,
Mark Woolhouse

---

**From:** Catherine.Calderwood@gov.scot <Catherine.Calderwood@gov.scot>
**Sent:** 25 January 2020 15:08
**To:** WOOLHOUSE Mark <Mark.Woolhouse@ I&S
**Cc:** Gregor.Smith@gov.scot <Gregor.Smith@gov.scot>; CMO@gov.scot <CMO@gov.scot>
**Subject:** RE: novel coronavirus CONFIDENTIAL

Mark
Thank you for this. I have shared it with my CMO/DCMO colleagues and we will discuss at our tc meeting on Monday.
With best wishes
Catherine

---

**From:** WOOLHOUSE Mark <Mark.Woolhouse@ I&S
**Sent:** Saturday, 25 January 2020 13:00
**To:** Chief Medical Officer
**Subject:** RE: novel coronavirus CONFIDENTIAL

Dear Catherine,
Thank you for you quick reply. Forgive me bothering you on a weekend but the situation is developing rapidly.

I have discussed what I am telling you here with Jeremy Farrar, Director of Wellcome Trust, and Neil Ferguson of the Who Collaborating Centre for Infectious Disease Modelling at Imperial College London.
They have independently reached the same conclusions and have advised Chris Whitty accordingly.
WHO reported 2 key numbers in their statement last week. The basic reproduction number (central estimate R0=2.0) and the case fatality rate (CF=4%). Another relevant number is the generation time (we have only incomplete data for that at the moment, but it's not crucial for the main result).
If you were to put those numbers into an epidemiological model for Scotland (and many other countries) you would likely predict that, over about a year, at least half the population will become infected, the gross mortality rate will triple (more at the epidemic peak) and the health system will become completely overwhelmed. We can formalise those predictions (and there are many caveats to them) but those are the ballpark numbers based on information from WHO. Please note that this is NOT a worst case scenario, this is based on WHO's central estimates and currently available evidence. The worst case scenario is considerably worse.
There are very good reasons to suppose it might not be as bad as that, but we need additional evidence (not currently available, but hopefully coming soon) to move the dial on those predictions. The key number is the case fatality rate. If that has been overestimated because of a preponderance of undetected cases the that would make a substantial difference.
Your reply to my earlier e-mail did not give any indication that here in Scotland we are preparing for a R0=2, CF=0.04 event. And I don't have the sense that we are from my networks here either.
It is still possible that this outbreak can be contained and that Scotland and the rest of the UK escapes relatively lightly. But I, and others, consider this more of a hope than an expectation at this stage.
Kind regards,
Mark Woolhouse

Professor M.E.J. Woolhouse OBE FRSE FMedSci,

Usher Institute,
Ashworth Laboratories, Kings Buildings, University of Edinburgh,
Charlotte Auerbach Road, Edinburgh EH9 3FL, UK

Tel. **Irrelevant & Sensitive**
Fax
Email mark.woolhouse@ **I&S**
www.epigroup.biology.ed.ac.uk

THE UNIVERSITY of EDINBURGH | usher institute

"Better health, better futures"

**From:** CMO@gov.scot <CMO@gov.scot>
**Sent:** 21 January 2020 13:52
**To:** WOOLHOUSE Mark <Mark.Woolhouse@ I&S
**Subject:** RE: novel coronavirus

Dear Mark,

Many thanks for your email.

I wanted to reassure you that I am well aware of developments regarding the novel coronavirus associated with Wuhan (WnCov). I am receiving information from various sources including HPS. However, I am very grateful for your comments and reflections.

I am not surprised by the announcement of human to human transmission and am awaiting news from the surveillance developments in order that we can better gauge the impact of this novel virus. I am grateful for your views that this could become a widespread epidemic fuelled by mild cases but with mortality among vulnerable patients. I can reassure you that both Health Protection and Health Resilience colleagues are closely monitoring the situation and keeping me informed.

I will bear in mind your views on the potential surveillance difficulties facing us with WnCoV. I know that PHE and HPS are actively considering the detailed surveillance needs and investigations required for this novel virus and have no doubt that they, like you, feel surveillance systems need to be in place before the arrival of any cases. I am very much aware of the public health value of such systems and the need to prevent or control any epidemic if it becomes established.

I note your fears that this might develop into a potential pandemic and can assure you that response plans are in place. Colleagues are monitoring the situation and any developments closely and we will respond as required. I am assured by my advisers that, as far as we can judge, the potential public health impact of WnCoV is being appropriately assessed.

Kind regards

**Personal Data**
Dr Catherine Calderwood MA Cantab FRCOG FRCP Edin

Chief Medical Officer for Scotland

Ext: **Irrelevant & Sensitive**

Web: http://www.gov.scot/Topics/Health/About/Structure/Chief-Medical-Officer
Twitter: https://twitter.com/CathCalderwood1
LinkedIN: https://www.linkedin.com/in/catherine-calderwood-691979108
Blog: http://blogs.scotland.gov.uk/cmo/

SG Web: www.gov.scot

**From:** WOOLHOUSE Mark <Mark.Woolhouse@ **I&S**
**Sent:** 21 January 2020 09:19
**To:** Chief Medical Officer <CMO@gov.scot>
**Subject:** re: novel coronavirus

Dear Catherine,

You will be well aware of developments to the ongoing outbreak of respiratory disease caused by a novel coronavirus and currently centred on Wuhan, China.
I expect that my comments here will reflect and repeat what you are hearing from our colleagues in HPS and NHSS. But I am writing in the spirit that this is better said twice.

The obvious concern (increased by yesterday's not unexpected announcement of human-human transmission) is that this will become a pandemic, and therefore will affect Scotland. This is not yet certain, but in my judgement it is likely, certainly sufficiently likely that we should be prepared for the eventuality. Other colleagues share this view.

There are some instructive parallels with the H1N1 pandemic in 2009-10. Indeed, one possibility is that this could turn out to be quite similar in some key respects: a widespread epidemic fuelled by mild cases but with mortality among vulnerable patients.

Such an epidemic would be difficult to track. As in 2009-2010 what would be needed is an integrated surveillance set up that combines clinical surveillance, genomic surveillance, and serological surveillance. (The latter requiring an appropriate test; we and, I am sure, many others are working on this already). This should be unexceptionable. My reason for writing now is to emphasize that, based on experience of 2009-10, that system needs to put in place in advance of the arrival of the virus, so the sooner the better. If we wait until after the virus has arrived then we will miss information of public health value and our efforts to prevent of control the epidemic will be compromised.

A key element of any response will be data communication, both between the agencies involved and with the wider public health community. We have corresponded on this issue before and your office has assured me that, however formidable the obstacles to sharing health data in Scotland might be in normal circumstances, it would happen much more smoothly during a health emergency. That assurance may soon be tested.

In 2009-10 we were slow off the mark. Despite the assurances of the then Cabinet Secretary for Health that Scotland was among the best prepared countries in the world, it turned out that we weren't. I am hoping that history won't repeat itself. (And, of course, I am hoping that the situation will not develop as I fear it might, but I do think we have to consider this a real possibility).

Yours sincerely,
Mark Woolhouse

Professor M.E.J. Woolhouse OBE FRSE FMedSci,

Usher Institute,
Ashworth Laboratories, Kings Buildings, University of Edinburgh,
Charlotte Auerbach Road, Edinburgh EH9 3FL, UK

Tel. Irrelevant & Sensitive
Fax
Email mark.woolhouse@ I&S
www.epigroup.biology.ed.ac.uk